New Combinations in *Melaleuca* for Australian Species of *Callistemon* (Myrtaceae)

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Abstract. The Australian species of the bottlebrush genus *Callistemon* R. Brown are not sufficiently distinct from *Melaleuca* L. for *Callistemon* to be maintained as a separate genus. The primary character states used to justify maintenance of *Callistemon* are that its staminal filaments are free and not grouped. This breaks down as fused filaments in five groups, the defining features of *Melaleuca*, occur in some *Callistemon* species. Therefore, it is concluded that the two genera should be combined. The following new names are proposed for species being treated in a forthcoming account of *Melaleuca* for *Flora of Australia*: *M. faucicola* Craven, *M. flammea* Craven, *M. orophila* Craven, *M. paludicola* Craven, *M. salicina* Craven, *M. virens* Craven, and *M. williamsii* Craven. The following new combinations are established as transferred from *Callistemon*: *M. brachyandra* (Lindley) Craven, *M. chisholmii* (Cheel) Craven, *M. comboynensis* (Cheel) Craven, *M. flavovirens* (Cheel) Craven, *M. formosa* (S. T. Blake) Craven, *M. montana* (S. T. Blake) Craven, *M. pachyphylla* (Cheel) Craven, *M. pearsonii* (R. D. Spencer & Lumley) Craven, *M. phoenicea* (Lindley) Craven, *M. pityoides* (F. Mueller) Craven, *M. polandii* (F. M. Bailey) Craven, *M. recurva* (R. D. Spencer & Lumley) Craven, *M. shiressii* (Blakely) Craven, and *M. subulata* (Cheel) Craven. The following new combinations are also established from *Metrosideros*: *Melaleuca linearifolia* (Link) Craven, *M. linearis* var. *pinifolia* (Wendland) Craven, *M. pallida* (Bonpland) Craven, and *M. rugulosa* (Schlechtendal ex Link) Craven. Issues concerning a name in *Melaleuca* for the accepted species presently known as *Callistemon glaucus* (Bonpland) Sweet are mentioned.

Key words: Australia, *Callistemon*, *Melaleuca*, Myrtaceae.

Callistemon R. Brown is a well-known genus of Myrtaceae Adanson, cultivated widely in tropical to moderately temperate climates for its showy bottlebrush-shaped inflorescences. Within the family, *Callistemon* is closely related to *Melaleuca* L., from which it has been distinguished by contemporary authors (e.g., Johnson & Briggs, 1983; Byrnes, 1984; Barlow, 1986) on the basis of its stamens being dispersed around the hypanthium rim and the staminal filaments being free. *Melaleuca* has the stamens 5-grouped on the hypanthium, opposite the petals and fused for part, sometimes the greater part, of their length. *Callistemon* occurs indigenously in Australia and New Caledonia. The New Caledonian species assigned to *Callistemon* represent a different lineage to the species of that genus occurring in Australia and have also been transferred to *Melaleuca* (Craven & Dawson, 1998).

There was varying acceptance of *Callistemon* at generic level in the 19th century. In part this may have been because Brown (1814: 547) gave the genus an inauspicious beginning at the time of its first circumscription with the words: "The maximum of *Melaleuca* exists in the principal parallel, but it declines less towards the south than within the tropic, where its species are chiefly of that section which gradually passes into *Callistemon*, a genus formed of those species of *Metrosideros* [Banks ex Gaertner] that have inflorescence similar to that of *Melaleuca*, and distinct elongated filaments." Although Mueller (1864) treated species under the name *Callistemon*, he regarded the genus as being artificial. Bentham (1867: 118) treated *Melaleuca* and *Callistemon* as separate genera in *Flora Australiensis*, but he did comment that *Callistemon* "passes gradually into *Melaleuca*, with which F. Mueller proposes to reunite it." Baillon (1876) included *Callistemon* and two other genera (i.e., *Conothamnus* Lindley and *Lamarchea* Gaudichaud) in *Melaleuca*, recognizing them at sectional level; such a broad view of *Melaleuca* apparently has not been accepted by any subsequent worker.

It can be determined by virtue of their taxonomy, that a majority of taxonomists who studied *Callistemon* and *Melaleuca* in the 20th century accepted *Callistemon* as a valid genus (e.g., Cheel, 1924, 1925; Cheel & White, 1924; Blake, 1958, 1968; Briggs & Johnson, 1979; Carrick & Chorney, 1979; Johnson & Briggs, 1983; Byrnes, 1984; Barlow, 1986; Lumley &

Spencer, 1988, 1990; Molyneux, 1993; Spencer & Lumley, 1986a, b, 1991; Spencer, 1996). Briggs and Johnson (1979: 202) advocated taking the New Caledonian *Callistemon* species from that genus and treating them as either a separate genus or as part of *Melaleuca*. The morphological features supporting such an action were not given by Briggs and Johnson (1979), but from the context it seems that the *Melaleuca*-like leaves possessed by the New Caledonian callistemons were regarded by them as being taxonomically significant. Dawson (1978), as part of a study of the capsular-fruited Myrtaceae of the Pacific Ocean region, gave a combined generic description of *Melaleuca* and *Callistemon* on the grounds that they shared many features, although he (Dawson, 1992) treated them separately in a floristic treatment for New Caledonia. Craven and Dawson (1998) considered that the endemic New Caledonian species of the complex should be placed in the same genus and effected the transfer of the New Caledonian *Callistemon* species to *Melaleuca*. More recently, Craven and Lepschi (1999) noted that the circumscription of *Melaleuca* sensu Austral. auct. overlapped that of *Callistemon*.

Morphologically, there is very little evidence that can be advanced in support of the continued separate recognition of *Callistemon* and *Melaleuca*. The traditional feature of staminal filaments being free and dispersed in *Callistemon*, but fused and 5-grouped in *Melaleuca* breaks down, and fused, 5-grouped staminal filaments occur in some *Callistemon* species, as noted by several authors (Dawson, 1978; Johnson & Briggs, 1983; Byrnes, 1984; Craven & Dawson, 1998). The species in which this can be observed are the Australian *C. glaucus* (Bonpland) Sweet and *C. viminalis* (Solander ex Gaertner) G. Don, and the New Caledonian *C. buseanus* Guillaumin and *C. gnidioides* Guillaumin (the stamens in the latter sometimes being free). In *M. nervosa* (Lindley) Cheel the stamens are usually in the typical fused, 5-grouped condition, but rarely the filaments may be inserted directly on the hypanthium rim (i.e., no staminal ring or bundle claw is present), in which case they may be loosely 5-aggregated or dispersed around the hypanthium rim with no clustering evident. Orlovich et al. (1999) studied floral development in seven *Melaleuca* and four *Callistemon* species, with special attention being paid to the androecium. Although most of the species studied fell into two distinct groups based upon androecium development, corresponding to the typical melaleucoid and callistemonoid conditions, Orlovich et al. (1999) stated that there was a continuum between the two extremes and that there was no obvious point in this continuum for suggesting a division.

In the broader-leaved species of *Callistemon* the leaf venation is pinnate, whereas in *Melaleuca* the broader-leaved species of the *M. leucadendra* (L.) L. group have longitudinal venation (although it is pinnate in young seedlings of at least some species (Blake, 1968; Craven, unpublished data). Pinnate venation is not uncommon elsewhere in *Melaleuca* (e.g., *M. hypericifolia* Smith), and an intermediate longitudinal-pinnate condition can also occur (e.g., *M. elliptica* Labillardière and *M. groveana* Cheel & C. T. White). Another feature that may at first seem to separate the two genera is the presence of small processes or flaps on the distal, inner, fruiting hypanthial wall of many *Melaleuca* species. The flaps are in an antesepalous position (although the sepals per se usually have fallen) and may have a protective function against predation of the seed or may have a controlling function during seed shedding. These flaps are usually absent in *Callistemon*, but are present in *C. glaucus*, for example. In some cases, the flaps may be variably present within a species; in *M. fulgens* R. Brown flaps occur in some specimens but not in others.

Our knowledge and understanding of the interrelationships of the lineages within *Melaleuca* and its closer relatives will benefit from gene sequence research. The first such studies published are analyses of nrDNA sequence data from the 5 S and ITS-1 spacer regions (Ladiges et al., 1999; Brown et al., 2001) sourced from representatives of the *Beaufortia* suballiance sensu Briggs and Johnson (1979; modified in Johnson & Briggs, 1983). The *Beaufortia* suballiance is an informal taxon and is equivalent to the tribe Melaleuceae Burnett as defined by Wilson et al. (2005). Ladiges et al. (1999) sampled species of *Melaleuca* and *Callistemon* from Australia and New Caledonia for their study. Their analyses suggested that on the 5 S data the species studied fell into two major clades: the first clade containing some of the Australian melaleucas and all the Australian callistemons, and the second clade containing the New Caledonian melaleucas and callistemons, as well as most of the Australian melaleucas and all of the other sampled Melaleuceae genera. The jacknife values show that there is moderate to strong support for some of the higher level clades, but little support for the lower level clades. The ITS-1 data resulted in a topology with generally similar jacknife support, but with more major clades indicated; however, given the lack of lower level support, the tree may not be robust. Greater jacknife support is evident in the tree Ladiges et al. (1999) derived from analysis of a combined 5 S and ITS-1 data set, but even then lower level support is not strong. In suggesting that the endemic New Caledonian species of *Melaleuca* and *Callistemon* be

treated as a new genus, Ladiges et al. (1999) offered no morphological evidence supporting such an action, presumably coming to their conclusion solely on the basis of the 5 S and ITS-1 data.

The nrDNA research reported upon by Ladiges et al. (1999) was extended to include 72 ingroup (i.e., Melaleuceae) taxa by Brown et al. (2001), with a single outgroup taxon, *Lophostemon confertus* (R. Brown) P. G. Wilson & J. T. Waterhouse. The topology of the tree obtained from analysis of the combined data by Brown et al. (2001) is generally similar to that obtained by Ladiges et al. (1999) with two major clades evident. In one clade the New Caledonian species again form a clade sister to a group of Australian-centered *Melaleuca* species within a clade that contains some other *Melaleuca* species and all the sampled genera other than *Melaleuca* and *Callistemon*, i.e., *Beaufortia* R. Brown, *Calothamnus* Labillardière, *Conothamnus*, *Eremaea* Lindley, *Lamarchea*, *Phymatocarpus* F. Mueller, and *Regelia* Schauer. In the other clade, the Australian *Callistemon* species form a clade sister to a group of Australian *Melaleuca* species. The position of one species, *M. foliolosa* Bentham, was unresolved. Ladiges et al. (1999) and Brown et al. (2001) did not find evidence that paralogy was occurring, although this was not investigated per se in either study.

The significance of hybridization for molecular sequence studies in *Melaleuca* needs to be taken into account. There is some evidence in the literature that, where hybridization has occurred, inferred phylogenies derived from sequence data may be incongruent with the known relationships of the parental taxa. Fuertes Aguilar et al. (1999) in a study of *Armeria* Willdenow (Plumbaginaceae) found that cladistic analyses of ITS sequence data were incongruent with morphological relationships and concluded that introgression was responsible for the observed molecular pattern. The majority of *Armeria* species are diploid, and Fuertes Aguilar et al. (1999) believed that concerted evolution was acting to homogenize ITS in the introgressant populations. Hybridization and other issues relevant to the use of ITS for phylogenetic reconstruction in plants have been discussed by Álvarez and Wendel (2003), who concluded that the complex and unpredictable evolutionary behavior of ITS reduced its suitability for phylogenetic analysis.

The available evidence indicates that polyploidy, a good indicator of hybridization, may be a relatively infrequent phenomenon in *Melaleuca* and *Callistemon*. Perusal of the recorded chromosome counts for the two genera indicates that the great majority of species are diploid with $2n = 22$ (Rye, 1979; W3Tropicos, 2006) and with a few recorded instances of $2n = 24, 33, 44, 66$ (James, 1958; W3Tropicos, 2006). Rye (1979) recorded 71 counts being $2n = 22$, three of $2n = 24$, four of $2n = 33$, four of $2n = 44$, and one of $2n = 66$. Hybridization in nature has been noted in *Melaleuca* and *Callistemon* in the following instances: in the *M. leucadendra* species group (Blake, 1968; Cumming, pers. comm.); between *M. bracteata* F. Mueller and *M. styphelioides* Smith (Lepschi, pers. comm.); between diverse species of the *M. scabra* R. Brown group, i.e., *M. leuropoma* Craven and *M. systena* Craven (Craven, pers. obs.); between several species of the *M. uncinata* R. Brown complex (Broadhurst et al., in prep.); between *M. aspalathoides* Schauer and *M. holosericea* Schauer (Lepschi, pers. comm.); between *M. barlowii* Craven and *M. nematophylla* F. Mueller ex Craven (Craven, pers. obs.); between diverse species of the *M. laxiflora* Turczaninow group (Craven, pers. obs.); between *C. citrinus* (Curtis) Skeels and *C. subulatus* Cheel (Craven, pers. obs.); and is suggested between *M. alternifolia* (Maiden & Betche) Cheel and *M. linariifolia* Smith (Butcher et al., 1994, 1995). Many of the foregoing instances of hybridization are documented by herbarium specimens deposited in CANB. In several of the above instances (i.e., hybrids between *M. leuropoma* and *M. systena*, *M. barlowii* and *M. nematophylla*, and *C. citrinus* and *C. subulatus*), hybrid swarms were present indicating that the hybrids were fertile; whether or not backcrossing to either or both parents was also occurring was not known. Herbarium specimens identified as putative hybrids, or as being intermediate, between the following other species pairs are deposited in CANB: *M. araucarioides* Barlow and *M. bracteosa* Turczaninow, *M. arcana* S. T. Blake and *M. quinquenervia* (Cavanilles) S. T. Blake, *M. bracteosa* and *M. pomphostoma* Barlow, *M. coronicarpa* D. A. Herbert and *M. lateriflora* Bentham, *M. decussata* R. Brown and *M. gibbosa* Labillardière, *M. lasiandra* F. Mueller and *M. nervosa*, *M. monantha* (Barlow) Craven and *M. tamariscina* Hooker, and *M. rhaphiophylla* Schauer and *M. viminea* Lindley. Given that hybridization in *Melaleuca* is relatively widespread at the present time, it is not unreasonable to expect that it has been occurring over a long period. If hybrids are at least partly fertile and the existence of hybrid swarms are evidence of this, it may be expected that hybridization may have been accompanied by lineage sorting and/or concerted evolution leading to the introgression of foreign DNA into a particular species' lineage. Future molecular sequence studies should be designed to test for such introgression.

Based upon my observations of the morphology of all species of *Melaleuca* and *Callistemon*, together with representative species of the other genera of the Melaleuceae Burnett, i.e., *Beaufortia*, *Calothamnus*,

Conothamnus, *Eremaea*, *Lamarchea*, *Petraeomyrtus* Craven, *Phymatocarpus*, and *Regelia*, it is my conclusion that the species of *Melaleuca* and *Callistemon* should be placed within the same genus. In the following section the accepted taxa of *Callistemon* for which names are not yet available in *Melaleuca* are transferred to that genus.

In the case of the Western Australian species *Callistemon glaucus*, there is a prior applicable name in *Melaleuca*, *M. paludosa* R. Brown, that is not being taken up for the species. The name *M. paludosa* (Brown, 1812) is a taxonomic synonym of, and has nomenclatural priority for, this plant (Lumley & Spencer, 1988). Lumley and Spencer (1988), however, rejected the use of the epithet *paludosa* for the western species in *Callistemon* on the basis that the epithet had been persistently applied to an eastern Australian species, *C. paludosus* F. Mueller, published in 1858 (Mueller, 1858). The Mueller name is based on a misapplication by Schlechtendal (Lumley & Spencer, 1988) to the eastern species. Although there is no nomenclatural impediment to using *M. paludosa* for the western species, the name has never been used for the species since its description and it would create further, unnecessary confusion to do so now. Given that rejection of a name is possible under the *International Code of Botanical Nomenclature* (Greuter et al., 2000), a case is being prepared for the rejection of *M. paludosa* against *Metrosideros glauca* Bonpland and all other names based upon it.

1. **Melaleuca brachyandra** (Lindley) Craven, comb. nov. Basionym: *Callistemon brachyandrum* Lindley, J. Hort. Soc. London 4: 112. 1849. TYPE: England. Cultivated [Provenance: Australia, 1843, *comm. G. Grey*], *leg. ign. s.n.* (holotype, CGE not seen; isotype, CGE photo).
2. **Melaleuca chisholmii** (Cheel) Craven, comb. nov. Basionym: *Callistemon chisholmi* Cheel, Proc. Linn. Soc. New South Wales 50: 260. 1925. TYPE: Australia. Queensland: Thompson River Fall, 26 Aug. 1921, *J. R. Chisholm s.n.* (holotype, NSW; isotypes, BRI not seen, CANB).
3. **Melaleuca comboynensis** (Cheel) Craven, comb. nov. Basionym: *Callistemon comboynensis* Cheel, Proc. Linn. Soc. New South Wales 68: 184. 1943. TYPE: Australia. New South Wales: Upper Lansdowne, in crevices of rocks, 6 May 1925, *E. Cheel s.n.* (lectotype, designated here, NSW).

There are two other authentic collections in NSW, one of them a wild-collected collection (Comboyne, *E. C. Chisholm 280*) and the other a specimen from a plant cultivated from seed of the lectotype collection (Cultivated, Ashfield, Sydney, 25 Jan. 1943, *E. Cheel s.n.*). The date and locality attributed to the Cheel collection cited as type in the protologue, i.e., December 1926, is different from that given on the lectotype, but it appears that Cheel may not have been overly concerned with accuracy in the documentation aspects of taxonomic research. In any event, it has been thought desirable to lectotypify the name rather than to accept as a holotype the (apparently only) wild-collected collection that Cheel made.

4. **Melaleuca faucicola** Craven, nom. nov. Replaced name: *Callistemon pauciflorus* R. D. Spencer & Lumley, Muelleria 6: 295, f. 2. 1986. TYPE: Australia. Northern Terr.: Serpentine Gorge, Heavitree Range, 5 Aug. 1985, *H. I. Aston 2564* (holotype, MEL; isotypes, CANB, DNA not seen, MEL, PERTH not seen).

A new specific epithet is required as *pauciflora* is preempted in *Melaleuca* by *M. pauciflora* Turczaninow. The new epithet is derived from the Latin "faux," throat, hence gorge, and "-cola," inhabitant or dweller, in reference to the habitat in which this species occurs.

5. **Melaleuca flammea** Craven, nom. nov. Replaced name: *Callistemon acuminatus* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 63, t. 23. 1911. TYPE: Australia. New South Wales: on rocky mountain slopes, Crawford River, 11 km from Bulahdelah, 19 Oct. 1902, *E. Cheel s.n.* (lectotype, designated here, NSW).

The specimen designated lectotype above is of good quality and possesses buds, flowers, and young fruit, whereas Cheel's other syntype (Alum Mountain, Bulahdelah, Oct. 1907, *J. H. Maiden s.n.*, NSW) is in early flower. A second sheet from Crawford River (without collector or date) is not considered to represent syntype material.

Use of the epithet *acuminata* in *Melaleuca* is preempted by *M. acuminata* F. Mueller, and a new name is required. The epithet *flammea* is derived from the Latin "flammeus," fiery or fiery-red, in reference to the staminal filament color in this species.

6. **Melaleuca flavovirens** (Cheel) Craven, comb. nov. Basionym: *Callistemon rugulosus* var. *flavovirens* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 3: iv [in key]. 1911. *Callistemon flavo-virens* (Cheel) Cheel, Proc. Linn. Soc. New South Wales 50: 263. 1925. TYPE: Australia. New South Wales: Boonoo Boonoo, in creek bed into waterfall, Nov. 1904, *Boorman s.n.* (lectotype, designated here, NSW; isotype, BRI).

There is other syntype material in NSW (Queensland, Stanthorpe, Nov. 1904, *Boorman s.n.*), but this represents *Melaleuca pallida* (Bonpland) Craven. The material designated above as lectotype of *Callistemon rugulosus* var. *flavovirens* conforms with the protologue, and its choice as such maintains the usual application of the epithet.

7. **Melaleuca formosa** (S. T. Blake) Craven, comb. nov. Basionym: *Callistemon formosus* S. T. Blake, Proc. Roy. Soc. Queensland 69: 83, fig. 1C. 1958. TYPE: Australia. Queensland: near Kingaroy (near Edenvale Railway Station), low plateau, remnant of mixed low forest on red loam, Sep. 1954, *S. T. Blake 19704* (holotype, BRI; isotypes, AAU, CANB, MEL).
8. **Melaleuca linearifolia** (Link) Craven, comb. nov. Basionym: *Metrosideros linearifolia* Link, Enum. Pl. Hort. Reg. Berol. 2: 26. 1822. *Callistemon linearifolium* (Link) DC., Prodr. 3: 223. 1828. TYPE: Germany [Apparently cultivated in Berlin of Australian provenance] (holotype, G-DC not seen).
9. **Melaleuca linearis** Schrader & Wendland var. **pinifolia** (Wendland) Craven, comb. et stat. nov. Basionym: *Metrosideros pinifolia* Wendland, Coll. Pl. 1: 53, t. 16. 1807. *Callistemon pinifolium* (Wendland) Sweet, Hort. Brit. (Sweet). 155. 1826. TYPE: Germany. Cultivated at Hannover (type, Wendland, Coll. Pl. 1: 53, t. 16. 1807, the figure and description).

A specimen has not been located, and the name is here typified by the plate and description.

10. **Melaleuca montana** (S. T. Blake) Craven, comb. nov. Basionym: *Callistemon montanus* S. T. Blake, Proc. Roy. Soc. Queensland 69: 84, fig. 1D. 1958. TYPE: Australia. Queensland: Springbrook, 900 m, 12 Jan. 1931, *W. Rudder s.n.* (holotype, BRI; isotypes, CANB, NSW).
11. **Melaleuca orophila** Craven, nom. nov. Replaced name: *Callistemon teretifolius* F. Mueller, Linnaea 25: 387. 1853. TYPE: Australia. South Australia: Lake Torrens district, Elders Range, *F. Mueller s.n.* (lectotype, designated here, MEL ex hb. Steetz; isotype, MEL).

Mueller also described this species in the text of an account of his exploration (Mueller, 1853). It seems that both descriptions were published in April 1853, but that which appeared in *Linnaea* is accepted here as the protologue as it contains the technical description of the taxon. There are two sheets of apparently the same Mueller collection in MEL that are available for typification purposes, one each from the Mueller and Steetz herbaria. The sheet from the Steetz herbarium is more ample and is here designated lectotype.

The new epithet is required as *teretifolia* is preempted in *Melaleuca* by *M. teretifolia* Endlicher; the epithet is derived from the Greek "oros," mountain, and "philos," loving, hence mountain-loving.

12. **Melaleuca pachyphylla** (Cheel) Craven, comb. nov. Basionym: *Callistemon pachyphyllus* Cheel, in J. H. Maiden, Ill. N.S.W. Pl. 61, t. 22. 1911. TYPE: Australia. New South Wales: Bulahdelah, Oct. 1902, *E. Cheel s.n.* (lectotype, designated here, NSW).

Only three of the syntypes of *Callistemon pachyphyllus* have been seen: that designated lectotype above, a collection by Cheel (about 2.4 km from Bulahdelah, 18 Oct. 1902, NSW), and a collection by Baeuerlen (Wardell, Jan. 1892, No. 728, NSW). The lectotype is the specimen used for the illustration forming part of the protologue, has adequate flowers, fruit, and foliage, and conforms well with Cheel's concept of the species; for these reasons it is considered that lectotypification is feasible without all syntypes having been seen.

13. **Melaleuca pallida** (Bonpland) Craven, comb. nov. Basionym: *Metrosideros pallida* Bonpland, Descr. Pl. Malmaison 101, t. 41. 1816. *Callistemon pallidum* (Bonpl.) DC. Prodr. 3: 223. 1828. TYPE: France. Cultivated at the Jardin de la Malmaison, May 1815, *A. J. A. Bonpland s.n.* (holotype, P).
14. **Melaleuca paludicola** Craven, nom. nov. Replaced synonym: *Callistemon sieberi* DC., Prodr. (DC.) 3: 223. 1828. *Callistemon salignus* var. *sieberi* (DC.) F. Mueller, Fragm. 4: 55. 1864. *Callistemon salignus* f. *sieberi* (DC.) Siebert & Voss, Vilm. Blumengärtn. ed. 3, 1: 312. 1896. TYPE: Australia. New South Wales: 1825, *F. W. Sieber 637* (lectotype, designated by Lumley & Spencer, 1988: 413, G not seen; isotypes, PRC, W both not seen).

A new epithet is required as *sieberi* is preempted in *Melaleuca* by *M. sieberi* Schauer. The epithet *paludicola* is derived from the Latin "palus," swamp or marsh, and "-cola," inhabitant or dweller.

15. Melaleuca pearsonii (R. D. Spencer & Lumley) Craven, comb. nov. Basionym: *Callistemon pearsonii* R. D. Spencer & Lumley, Muelleria 6: 293, f. 1. 1986. TYPE: Australia. Queensland: Blackdown Tableland, Mimosa Creek, 14 Oct. 1984, *R. D. Spencer 84* (holotype, MEL; isotypes, BRI not seen, NSW).

16. Melaleuca phoenicea (Lindley) Craven, comb. nov. Basionym: *Callistemon phoeniceum* Lindley, Bot. Reg. App., Vols 1–23, x. 1839. TYPE: Australia. Western Australia: *J. Drummond s.n.* (lectotype, designated here, CGE not seen; isotype, CGE photo).

The type material in CGE consists of material of two collections mounted on the same sheet, that designated lectotype above and *J. Mangles s.n.* The Mangles collection is less adequate than Drummond's as it is in the late bud/flower expansion stage of development, whereas the Drummond specimen is in full flower.

17. Melaleuca pityoides (F. Mueller) Craven, comb. nov. Basionym: *Callistemon pityoides* F. Mueller, Australas. Chem. Drugg., Suppl. 5: 94. 1883. *Callistemon sieberi* var. *pityoides* (F. Mueller) Cheel, in J. H. Maiden, Forest Fl. N.S.W. 7: 59, in obs. 1917. TYPE: Australia. Victoria: Ovens River, Dec. 1882, *C. L. F. Falck s.n.* (lectotype, designated by Lumley & Spencer, 1988: 414, MEL).

18. Melaleuca polandii (F. M. Bailey) Craven, comb. nov. Basionym: *Callistemon polandii* F. M. Bailey, Queensland Fl. 6: 2003, pl. 88. 1902. TYPE: Australia. Queensland: Bloomfield River Mission Station [received at BRI, Jan. 1902], *W. Poland s.n.* (holotype, BRI).

19. Melaleuca recurva (R. D. Spencer & Lumley) Craven, comb. nov. Basionym: *Callistemon recurvus* R. D. Spencer & Lumley, Muelleria 7: 255, f. 2. 1990. TYPE: Australia. Queensland: Mt. Stewart, E of Herberton, on granite, May 1977, *R. Russell s.n.* (holotype, BRI).

20. Melaleuca rugulosa (Schlechtendal ex Link) Craven, comb. nov. Basionym: *Metrosideros rugulosa* Schlechtendal ex Link, Enum. Pl. Hort. Berol. Alt. 2: 27. 1822. *Callistemon rugulosum* (Schlechtendal ex Link) DC., Prodr. (DC.) 3: 223. 1828. TYPE: Germany. Cultivated in Berlin Botanic Garden, 1826, *C. F. Otto s.n.* (neotype, designated by Lumley & Spencer, 1988: 411, G-DC not seen).

21. Melaleuca salicina Craven, nom. nov. Replaced name: *Metrosideros saligna* Smith, Trans. Linn. Soc. London, Bot. 3: 272. 1797. *Callistemon salignum* (Smith) Sweet, Hort. Brit. 155. 1826. TYPE: Australia. New South Wales [Precise locality not known], *leg. ign. s.n.* (holotype, LINN not seen; isotypes, K, LIV).

A new epithet is required as *saligna* is preempted in *Melaleuca* by *M. saligna* (J. F. Gmelin) Blume. The epithet *salicina* has a similar meaning to "saligna" (willow-like) and also is derived from the generic epithet of the willow genus, *Salix*.

22. Melaleuca shiressii (Blakely) Craven, comb. nov. Basionym: *Callistemon shiressii* Blakely, Austral. Nat. 10: 257. 1941. TYPE: Australia. New South Wales: Narara [1.6 km W of railway station], 26 Dec. 1929, *W. F. Blakely & D. W. C. Shiress s.n.* (holotype, NSW; isotype, CANB).

Wilson (pers. comm., 1996) has provided some insights into the typification of this species: "the protologue reads, in part, 'W. F. Blakely and D. W. C. Shiress, 5/1927, and 26/2/1929, the type.' I take the wording to indicate that the second specimen is to be considered as holotype. There is, however, no specimen that matches this precisely, but there is one that is dated 26/12/1929 and I am convinced that this is the intended type, the date in the protologue being a typographic error. (In fact, our copy of the journal has a '1' pencilled in before the 2.)" Wilson's interpretation is accepted for the type citation above.

23. Melaleuca subulata (Cheel) Craven, comb. nov. Basionym: *Callistemon subulatus* Cheel, Proc. Linn. Soc. New South Wales 50: 259. 1925. TYPE: Australia. New South Wales: bed of the Nattai River, via Colo, Oct. 1912, *E. Cheel s.n.* (holotype, NSW).

24. Melaleuca virens Craven, nom. nov. Replaced name: *Metrosideros viridiflora* Sims, Bot. Mag. 52: t. 2602. 1825. *Callistemon viridiflorum* (Sims) Sweet, Hort. Brit. (Sweet) 155. 1826. *Callistemon salignus* var. *viridiflorus* (Sims) F. Mueller, Fragm. 4: 55. 1864. *Callistemon salignus* f. *viridiflorus* (Sims) F. Mueller ex Siebert & Voss, Vilm. Blumengärtn. ed. 3, 1: 312. 1896. TYPE: Cultivated in England, the provenance being Australia (lectotype, designated here, Sims, Bot. Mag. 52: t. 2602. 1825).

A new epithet is required as *viridiflora* is preempted in *Melaleuca* by *M. viridiflora* Solander ex Gaertner. The word "virens" is derived from the Latin "viridis," green, in reference to the replaced epithet. A specimen has not been located, and the name is here lectotypified by the plant and description.

25. Melaleuca williamsii Craven, nom. nov. Replaced name: *Callistemon pungens* Lumley & R. D. Spencer, Muelleria 7: 253, f. 1. 1990. TYPE: Australia. New South Wales: ca. 0.3 km along road to Armidale from jct. with road from the Armidale/Dorrigo Road to Hillgrove (ca. 4 km from hwy.), 21 Nov. 1983, *P. F. Lumley 1150* (holotype, MEL; isotypes, CANB, K not seen, NE, NSW not seen).

A new specific epithet is required as *pungens* is preempted in *Melaleuca* by *M. pungens* Schauer. The new epithet is in memory of John Beaumont Williams (1932–2005) of Armidale, New South Wales, who generously made available to me his extensive field knowledge of this group of plants as it occurs in the New England region of New South Wales.

Acknowledgments. Special thanks are due to Roger Spencer, who freely made available the notes and other information that Peter Lumley and he had gathered in connection with their own studies of the callistemonoid species; Roger and I have enjoyed many discussions on the complex issues associated with classifying this group of plants. Bill Molyneux assisted with his detailed knowledge of the complex callistemons of East Gippsland, Victoria; our respective conclusions as to their taxonomic status may differ, but our appreciation of the plants in question is very similar. Peter Wilson provided information on certain types lodged in NSW. Tony Orchard discussed nomenclatural matters relating to acceptance or otherwise of particular names. The directors and/or curators of the following herbaria are thanked for the opportunity to study specimens in their care during my work on *Melaleuca*: AAU, AD, B, BM, BR, BRI, C, CANB, DNA, E, G, GH, HO, K, KW, L, LD, LE, LIV, MANCH, MBA, MEL, NSW, NY, P, PERTH, U, and W. The following herbaria are thanked also for contributing photographs, photocopies, etc. of specimens: B, FI. This research has been funded in part by the Australian Biological Resources Study.

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